

WHAT IS CLAIMED IS:

1. A method for determining a useful life applied to a coating on a surface of a component coupled to at least one of a rotatable member and a stationary member of a rotary machine, said method comprising:

directing a laser across a surface of the component while the rotatable member remains coupled within an assembled rotary machine; and

measuring radiation emitted from the surface of the component.

2. A method in accordance with Claim 1 further comprising analyzing the radiation emitted from the surface of the component.

3. A method in accordance with Claim 2 wherein analyzing the radiation emitted from the surface of the component further comprises determining the characteristic spectra of the chemical composition of the coating.

4. A method in accordance with Claim 1 further comprising calculating the useful life of the coating of the component based on the amount of measured radiation emitted from the component.

5. A method in accordance with Claim 4 wherein calculating the useful life of the coating of the component further comprises calculating the percentage of aluminum by weight in the coating.

6. A method in accordance with Claim 4 wherein calculating the useful life of the coating of the component further comprises calculating the percentage of nickel by weight in the coating.

7. A method in accordance with Claim 1 wherein directing a laser across a surface of the component further comprises vaporizing a layer of coating of the component using the laser.

8. A method in accordance with Claim 1 wherein directing a laser across a surface of the component further comprises directing a neodymium pulsed laser across the surface of the component being examined.

9. A method in accordance with Claim 1 wherein measuring radiation emitted from the surface of the component further comprises using a spectrometer to measure the amount of radiation emitted from the surface of the component.

10. A method for determining a useful life of a coating applied across at least one of a turbine blade component and a turbine nozzle component coupled to a turbine rotor that is rotating coupled in position within an assembled turbine, said method comprising:

vaporizing a portion of the coating applied to at least one of the turbine blade component and the turbine nozzle component using a laser;

measuring radiation emitted from the surface of the component being examined to determine the chemical composition of the coating;

calculating the useful life of the coating based on the chemical composition of the coating.

11. A method in accordance with Claim 10 wherein vaporizing a portion of the coating applied to at least one of the turbine blade component and the turbine nozzle component further comprises vaporizing a layer of the coating using a neodymium pulsed laser.

12. A method in accordance with Claim 10 wherein measuring radiation emitted from the surface of the component further comprises measuring radiation emitted from the surface of the component using a digital spectrometer.

13. A method in accordance with Claim 10 wherein measuring radiation emitted from the surface of the component further comprises measuring the intensity of characteristic spectrum lines emitted from the coating.

14. A method in accordance with Claim 10 further comprising determining an amount of beta aluminide in the coating.

15. A method in accordance with Claim 10 wherein calculating the useful life of the coating of the component further comprises calculating the useful life of the coating as a function of at least one of time and temperature.

16. A method in accordance with Claim 10 further comprising applying additional coating to the component based on the chemical composition.

17. A laser pulse spectrometer system comprising a computer program embodied on a computer readable medium for controlling said laser pulse spectrometer system, said computer program comprising a code segment that receives user selection input data and then remotely instructs said system to:

vaporize a layer of coating of a component of a turbine with a laser;

measure radiation emitted from the surface of the component to determine the chemical composition of the coating;

analyze the chemical composition of the coating as a function of depth of the laser; and

calculate a useful life of the coating of the component.

18. A laser pulse spectrometer system in accordance with Claim 17 further configured to measure radiation emitted from the surface of the component using a digital spectrometer.

19. A laser pulse spectrometer system in accordance with Claim 17 further configured to vaporize a layer of coating of a component of a turbine using a neodymium pulsed laser.

20. A laser pulse spectrometer system in accordance with Claim 17 further configured to determine the characteristic spectra of the chemical composition of the coating.

21. A laser pulse spectrometer system in accordance with Claim 17 further configured to calculate the percentage of aluminum by weight in the coating.

22. A computer program embodied on a computer readable medium for controlling a laser pulse spectrometer system, said computer program comprising a code segment that receives user selection input data and then remotely instructs said system to:

vaporize a layer of coating of a component of a turbine with a laser;

measure radiation emitted from the surface of the component to determine the chemical composition of the coating;

analyze the chemical composition of the coating as a function of depth of the laser; and

calculate a useful life of the coating of the component.

23. A computer program in accordance with Claim 22 further configured to measure radiation emitted from the surface of the component using a digital spectrometer.

24. A computer program in accordance with Claim 22 further configured to vaporize a layer of coating of a component of a turbine using a neodymium pulsed laser.

25. A computer program in accordance with Claim 22 further configured to determine the characteristic spectra of the chemical composition of the coating.

26. A computer program in accordance with Claim 22 further configured to calculate the percentage of aluminum by weight in the coating.